

AD-A058 390

WOODS HOLE OCEANOGRAPHIC INSTITUTION MASS
RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES.(U)
AUG 78 W A WATKINS, J M JOHNSON, D WARTZOK
WHOI-78-51

F/G 8/1

UNCLASSIFIED

N00014-74-C-0262

NL

| OF |
AD
A058390

END
DATE
FILMED
11-78
DDC

UNCLASSIFIED

8/78

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER WHOI-78-51	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES	5. TYPE OF REPORT & PERIOD COVERED Technical rept.	
6. AUTHOR(s) William A. Watkins, James H. Johnson Douglas Wartzok	7. CONTRACT OR GRANT NUMBER(s) N00014-74-C-0262	
8. PERFORMING ORGANIZATION NAME AND ADDRESS Woods Hole Oceanographic Institution Woods Hole, MA 02543	9. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR 083-004	
10. CONTROLLING OFFICE NAME AND ADDRESS NORDA National Space Technology Laboratory Bay St. Louis, MS 39529	11. REPORT DATE August 1978	
12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	13. NUMBER OF PAGES 13	
	14. SECURITY CLASS. (of this report) Unclassified	
15. DECLASSIFICATION/DOWNGRADING SCHEDULE		
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited. 12 18 p.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) 1. Radio tagging whales 2. Whales tagged 3. Tagging whales		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Two finbacks (<i>Balaenoptera physalus</i>) and three humpback whales (<i>Megaptera novaeangliae</i>) were tagged and tracked in Prince William Sound, Alaska (1 - 30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. (Cont. on back)		

DD FORM 1 JAN 73 1473A EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

UNCLASSIFIED 8/78

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

382 000

alt

The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.

A

ADDITIONAL		
WVS	White Section	<input checked="" type="checkbox"/>
DOC	Buff Section	<input type="checkbox"/>
UNANNOUNCED		<input type="checkbox"/>
IDENTIFICATION		
BY		
DISTRIBUTION/AVAILABILITY CODES		
Dist.	AVAIL.	and/or SPECIAL
A		

WHOI-78-51

RADIO TAGGING REPORT OF
FINBACK AND HUMPBACK WHALES

by

William A. Watkins
James H. Johnson
Douglas Wartzok

WOODS HOLE OCEANOGRAPHIC INSTITUTION
Woods Hole, Massachusetts 02543

August 1978

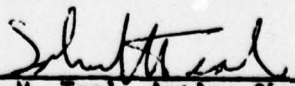
TECHNICAL REPORT

*Prepared for the Office of Naval Research
under Contract N00014-74-C-0262; NR 083-004.*

*Reproduction in whole or in part is per-
mitted for any purpose of the United States
Government. In citing this manuscript in
a bibliography, the reference should be
followed by the phrase: UNPUBLISHED
MANUSCRIPT.*

*Approved for public release; distribution
unlimited.*

Approved for Distribution


John M. Teal, Acting Chairman
Department of Biology

78 08 24 006

RADIO TAGGING REPORT of FINBACK and HUMPBACK WHALES

William A. Watkins
James H. Johnson
Douglas Wartzok

ABSTRACT

Two finbacks (Balaenoptera physalus) and three humpback whales (Megaptera novaeangliae) were tagged and tracked in Prince William Sound, Alaska (1 - 30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.

INTRODUCTION

Radio Tagging of whales provides positive individual identity, a means of keeping track of the tagged whale even under conditions of low visibility, and help in later relocating that same whale (Norris, Evans, and Ray 1974; Watkins 1978). Because of the difficulties in approaching and handling large animals at sea, a whale tag has to be remotely attached. The radio on a whale produces a tracking signal whenever the antenna is lifted free of the water.

Efforts to develop such a tag began with a radio attachment for right whales in 1962 (Schevill and Watkins 1966), and progressed through a series of experiments in cooperation with other investigators working on both the transmitting and receiving components of a tracking system (Evans 1971; Martin, Evans, and Bowers 1971; Watkins and Schevill 1977; Watkins 1978). A tag that included a 200-mwatt, 27-30MHz transmitter and its power supply in a 1.9 cm x 24 cm tubular stainless steel case was manufactured for us by Ocean Applied Research Corp. (San Diego). The radio tag was fitted with a point for blubber and adapted for launching from a modified shotgun. The ballistics of the system were tested and then the tags were tried on whale carcasses in

Iceland, and on live whales during three experiments by Ray, Wartzok, and Mitchell on finbacks in the St. Lawrence River, and by Tillman, Johnson and Wolman on two groups of humpbacks in Southeast Alaska. The attachment worked, the tag transmitted and the tracking systems made it possible to follow the tagged whales. We now needed a more comprehensive whale tagging test that would be well enough manned and funded so that we could compare the tagging of the two species of whales, track the tagged animals, and ascertain the duration of the implanted tag. We needed an assessment of the utility of the radio whale tag.

We conducted a test series, therefore, in Prince William Sound, Alaska (June 1978) where both finback and humpback whales could be found in relatively sheltered waters. It was a cooperative experiment with contributions from each of the participating organizations, boat charter funds from the National Marine Fisheries Service (Marine Mammal Division, Seattle), and main funding and back-up support from the Office of Naval Research (Oceanic Biology Program). In addition, ONR and WHOI (Marine Policy Program) made it possible to extend the period of tracking with additional contingency funding in case the radio tracking had lasted beyond the initial 30-day experiment.

A preliminary report of the results of this test series was included as a part of our report of the whale tagging to the National

Marine Fisheries Service, Permit Division. The text of this report
is reproduced here.

William A. Watkins
Woods Hole Oceanographic Institution
Woods Hole, Mass. 02543

James H. Johnson
National Marine Fisheries Service
Marine Mammal Division
Seattle, Washington 98115

Douglas Wartzok
The Johns Hopkins University
Baltimore, Md. 21205

Radio Tagging of Finback and Humpback Whales

Report to National Marine Fisheries Service,
Marine Mammal Permit #135

12 July 1978

We report a successful whale tagging experiment conducted 1 - 30 June, 1978, in Prince William Sound, Alaska, under Marine Mammal Permit #135. This was a joint experiment with the National Marine Fisheries Service (Marine Mammal Division) — Johnson, Wolman, Towner; The Johns Hopkins University — Wartzok; Fish and Wildlife Service — Hall; and the Woods Hole Oceanographic Institution — Schevill, Moore, Watkins. During the experiment, five finbacks (Balaenoptera physalus) and three humpbacks (Megaptera novaeangliae) were "taken", including all tagging attempts.

The purposes of the experiment were two-fold. First, we wanted to compare the implantation of the radio whale tags in these two species and to compare this with previous tests on fresh whale carcasses. Secondly, we needed to find out how long the tags would remain implanted in a whale. Behavioral information was not as important.

The radio whale tags and our receiving gear were made for us by Ocean Applied Research Corporation, San Diego, and we had the help of Romaine Maiefski, the engineer involved in the tag development. We used two boats with aircraft support and had funds and personnel

available cooperatively for longer term tracking of the tagged whales if that had proved feasible. Nick Rauch, Fred Joiner, Jim Anderson, and Doug Palmquist provided good help as boat and aircraft operators.

The tagging was conducted from only one boat to see if the whales would later react adversely toward that boat. Before approaching any whales, we practiced the tagging procedure for several hours on a floating target. Romaine Maiefski did all of the whale tagging, successfully implanting the tags at ranges of 6 1/2 to 25 m. The tags were sterilized before implantation with a preparation of zephrene chloride (Roccal). Each whale was tagged with a different radio frequency and a different (5 x 60 cm) colored streamer.

A summary of the tagging follows:

- Finback, 16 m, Red tag #012 4 June 1455
- tagged 60 cm ahead of and 15 cm below dorsal fin
 - partially pulled out within a few hours
 - periodic visual and radio contact through 22 June 0550
(minimum duration - 17 days, 9 hrs)
 - tag protruding more and more
 - tag gone 26 June 2000
 - whale observed from 0930 to 1800 28 June
- Finback (same whale) — attempted re-tagging of "Red" 5 June 1345
- tagged 2 m behind blowhole and 60 cm down
 - tag traversed 30 cm or more of water
 - penetrated blubber only, to about 5 cm
 - immediately fell out — tag retrieved
- Finback (same whale) — successful re-tagging of "Red" 12 June 1735
- orange tag #013
 - tagged 2.5 m ahead of dorsal fin, to right of midline
 - tag partially pulled out within one hour
 - radio operational for two hours only (perhaps
damaged by whale)
 - tag protruding more
 - sighted periodically until 28 June 1830
(minimum duration - 16 days, 1 hr)
- Finback, 16 - 17 m — unsuccessful attempt to tag 6 June 1145
- a companion to "Red"
 - tag hit high on back, at very low angle
 - 1 m ahead of dorsal fin — ricochet
 - no obvious marks on whale — tag retrieved
- Finback, 18 m, Green tag #026 6 June 1435
- tagged 2.5 m behind blowhole and down 1 m
 - relocated visually and by radio 6 June 1900
 - tag orientation changed (perhaps partially
pulled out)
 - relocated by radio and fleeting glimpse 10 June 2100
(minimum duration - 4 days, 5 hrs)
 - possible radio signal 14 June 0540

("Green" was monitored very little since
"Red" proved to be more easily located.)

Humpback, 11.5 m, Blue tag #C29 7 June 1245
 - tagged 1.5 m behind blowhole, to left of midline
 - tracked until 7 June 2030
 (minimum duration - 8 hrs)
 - possible radio signal 10 June 2100

(Otherwise, no contact with this whale,
but also monitored very little.)

Humpback, 12 m, Yellow tag #028 9 June 1145

- tagged 1 m ahead and about 30 cm below dorsal fin
- tag partially protruding by next day
- tracked as much as possible throughout this period
- tag protruded by varying amounts
- tracking terminated with tag barely hanging in place,
and poor antenna orientation 21 June 1830
(minimum duration - 12 days, 6 hrs)
- possible radio contact 25 June 2200

(This whale was followed as our major tracking effort.)

Humpback, 12.5 m, <u>Orange</u> tag #032	9 June	1300
- in the same group of whales as "Yellow"		
- tagged 15 cm behind and 60 cm below dorsal fin		
- tracked until it separated from "Yellow"	10 June	0200
- relocated visually and by radio	11 June	1415
- tag seems to be partially protruding		
- tracked	from 24 June	1000
	to 25 June	2130
(minimum duration - 14 days, 8 hrs)		
-tag hanging loosely, protruding more and more		

Intense searching for the next four to five days found none of these humpbacks.

Our conclusions are tentative pending review of the photographic evidence, and opportunity for consideration of the varied observations.

The implantation of the radio whale tag was essentially identical for finbacks and humpbacks and we could see no differences from our previous experiments on fresh whale carcasses in Iceland. In most cases, there was little obvious reaction by the whales to the actual tag implantation, but a much larger reaction to boat propeller cavitation. The close approach for tagging seemed more unsettling to the whales than the tagging itself. In each case, the whales returned to apparently normal routines within a few minutes or hours of the tagging. We were successful in approaching for re-tagging the same whale three times from the same boat. The whales did not appear to object to the tagging boat any more than they did other boats.

It appears that the 1978 radio whale tags remained in place for only two to three weeks. The tags backed out at variable rates, with different amounts of tag showing at different times, but generally protruding more and more with time. There was no evidence on infection. Observations of the tag site (on one whale, "Red") after the tag had come out, showed no marks, no visible scar or deformity.

The radio signal provided very positive identification of the tagged whale. The tag radio shut off underwater and only transmitted well when the entire tag was out of water, so that the placement of the

tag and the varying behavior of the tagged whale controlled the amount of signal radiated. The whales' behavior included periodic sequences of prolonged duration (sometimes hours) during which the radio tag was kept underwater. During these times we could only track the whales visually by their occasional blows. We recorded maximum radio ranges to tagged whales of 12 to 17 km, but reliable tracking signals could only be received at ranges of 3 to 5 km. Thus, continuous tracking proved to be very difficult, especially during periods of low visibility.

The tagged finback whale that we were able to track remained apparently feeding in relatively restricted areas, while the tagged humpbacks appeared to roam rather widely, sometimes moving 100 km or more a day. Radio tracking provided a detailed scrutiny of the behavior of the tagged whales. Though we had to break off because of adverse weather, fuel replenishment, boat repairs, etc., we were successful in staying with specific whales for periods of up to 90 hours of continuous tracking. Relocating lost whales even in such restricted waters required intense searching. Sometimes the radio signal provided the first indication of the presence of our tagged whale, but often the whales were located visually first then the radio confirmed that we had the tagged animals.

Because of the radio signal, we were able to relocate "Red", the finback, nearly every time we passed through its territory, even

though we were mainly trying to stay with another whale. Our 24-day contact with "Red" provided a longer series of behavioral information, including both day and night observations, than has been possible before with any individual fin whale. The positive knowledge that this was indeed the same whale makes this information all the more meaningful.

Relatively long periods of continuous tracking of humpback whales, with total tracking sequences of up to 186 hours with individuals were made possible by the radio tag, and provided glimpses of their behavior that have not previously been available. Again, the certainty that we were observing the same whale in spite of low visibility and sudden changes in behavior makes this data unique. Over this period, we followed individual whales, as they fed, moved rapidly to new locations tens of km away, stopped to socialize with passing groups of whales, lay quietly just below the surface perhaps to rest, rolled and twisted in courtship and sexual activities, or breached and jumped in spectacular aerial displays.

The radio tag permitted tracking, and relocating of individuals and it also made it possible to maintain occasional contact with more than one of the tagged animals at once. The two tagged finbacks and two of the tagged humpbacks were found sometimes in the same general area — three of these in the same water on a few occasions.

With the two boats and three to four trained observers on each,

we were able to maintain contact with a tagged whale around the clock. Any less effort would have been unsuccessful. Our attempts to supplement this with aerial tracking proved difficult, probably because of the erratic behavior of the whales and their relatively long submergence times.

William A. Watkins
Woods Hole Oceanographic Institution

REFERENCES

- Evans, William E. 1971. Orientation behavior of delphinids: radio telemetric studies. *Annals N. Y. Acad. Sci.*, 188, pp. 142-160.
- Martin, Hugh B., William E. Evans, and C. A. Bowers. 1971. Methods for radio tracking marine mammals in the open sea. *Proc. IEEE Conference on Eng. Ocean Environ.*, Sept., pp. 1-6.
- Norris, Kenneth S., William E. Evans, and G. Carleton Ray. 1974. New tagging and tracking methods for the study of marine mammal biology and migration. pp. 395-408. *In*: W.E. Schevill (ed.), *The Whale Problem*, Harvard Press, Cambridge, Mass. 419 pp.
- Schevill, William E., and William A. Watkins. 1966. Radio-tagging of whales. Ref. No. 66-17, Woods Hole Oceanographic Institution, Woods Hole, Mass., 15 pp., 10 figs., (unpublished manuscript).
- Watkins, William A. 1978. A radio tag for big whales. *Oceanus*, 21 (2), pp. 48-54.
- Watkins, William A., and William E. Schevill. 1977. The development and testing of a radio whale tag. Ref. No. 77-58, Woods Hole Oceanographic Institution, Woods Hole, Mass., 38 pp., 12 figs. (unpublished manuscript).

MANDATORY DISTRIBUTION LIST

FOR UNCLASSIFIED TECHNICAL REPORTS, REPRINTS, & FINAL REPORTS
PUBLISHED BY OCEANOGRAPHIC CONTRACTORS
OF THE OCEAN SCIENCE AND TECHNOLOGY DIVISION
OF THE OFFICE OF NAVAL RESEARCH

(REVISED FEBRUARY 1978)

1	Director of Defense Research and Engineering Office of the Secretary of Defense Washington, D.C. 20301 ATTN: Office Assistant Director (Research)	1	National Oceanographic Data Center National Oceanic & Atmospheric Administration 330C Whitehaven St., N.W. Washington, D.C. 20235
	Office of Naval Research Arlington, VA 22217	12	Defense Documentation Center Cameron Station Alexandria, VA 22314
1	ATTN: (Code 460)		Commander Naval Oceanographic Office Washington, D.C. 20373
1	ATTN: (Code 102-OS)	1	ATTN: Code 1640
1	ATTN: (Code 200)	1	ATTN: Code 70
1	CDR J. C. Harlett, (USN) ONR Representative Woods Hole Oceanographic Inst. Woods Hole, MA 02543	3	NORDA 430 NSTL Station, MS 39529
1	Office of Naval Research Branch Office 495 Summer Street Boston, MA 02210	2	CO NORDA NSTL Station, MS 39529
	Director Naval Research Laboratory Washington, D.C. 20375		
6	ATTN: Library, Code 2620		

<p>WOODS HOLE OCEANOGRAPHIC INSTITUTION WHOI-78-51</p> <p>RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES by William A. Watkins, James M. Johnson and Douglas Martzok. 13 pages. August 1978. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004.</p> <p>Two finbacks (<i>Balaenoptera physalus</i>) and three humpback whales (<i>Megaptera novaeangliae</i>) were tagged and tracked in Prince William Sound, Alaska (17-30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.</p>	<ol style="list-style-type: none"> 1. Radio tagging whales 2. Whales tagged 3. Tagging whales <ol style="list-style-type: none"> I. Watkins, William A. II. Johnson, James M. III. Martzok, Douglas IV. W00014-74-C-0262; NR 083-004 <p>This card is UNCLASSIFIED</p>
<p>WOODS HOLE OCEANOGRAPHIC INSTITUTION WHOI-78-51</p> <p>RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES by William A. Watkins, James M. Johnson and Douglas Martzok. 13 pages. August 1978. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004.</p> <p>Two finbacks (<i>Balaenoptera physalus</i>) and three humpback whales (<i>Megaptera novaeangliae</i>) were tagged and tracked in Prince William Sound, Alaska (17-30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.</p>	<ol style="list-style-type: none"> 1. Radio tagging whales 2. Whales tagged 3. Tagging whales <ol style="list-style-type: none"> I. Watkins, William A. II. Johnson, James M. III. Martzok, Douglas IV. W00014-74-C-0262; NR 083-004 <p>This card is UNCLASSIFIED</p>
<p>WOODS HOLE OCEANOGRAPHIC INSTITUTION WHOI-78-51</p> <p>RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES by William A. Watkins, James M. Johnson and Douglas Martzok. 13 pages. August 1978. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004.</p> <p>Two finbacks (<i>Balaenoptera physalus</i>) and three humpback whales (<i>Megaptera novaeangliae</i>) were tagged and tracked in Prince William Sound, Alaska (17-30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.</p>	<ol style="list-style-type: none"> 1. Radio tagging whales 2. Whales tagged 3. Tagging whales <ol style="list-style-type: none"> I. Watkins, William A. II. Johnson, James M. III. Martzok, Douglas IV. W00014-74-C-0262; NR 083-004 <p>This card is UNCLASSIFIED</p>
<p>WOODS HOLE OCEANOGRAPHIC INSTITUTION WHOI-78-51</p> <p>RADIO TAGGING REPORT OF FINBACK AND HUMPBACK WHALES by William A. Watkins, James M. Johnson and Douglas Martzok. 13 pages. August 1978. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004.</p> <p>Two finbacks (<i>Balaenoptera physalus</i>) and three humpback whales (<i>Megaptera novaeangliae</i>) were tagged and tracked in Prince William Sound, Alaska (17-30 June 1978) with 27 and 30-MHz radio tags. The implantation of the tag was found to be essentially identical for the two species. The whales returned to apparently normal routines within a short time of tagging. The 1978 radio whale tags remained in place for only two to three weeks, generally protruding more and more with time. There was no evidence of infection. The radio signal provided positive identification of the tagged whales and permitted tracks of the whales' movement as well as detailed studies of their behavior.</p>	<ol style="list-style-type: none"> 1. Radio tagging whales 2. Whales tagged 3. Tagging whales <ol style="list-style-type: none"> I. Watkins, William A. II. Johnson, James M. III. Martzok, Douglas IV. W00014-74-C-0262; NR 083-004 <p>This card is UNCLASSIFIED</p>